

# Model 421 Gaussmeter

- Resolution to 4¾ Digits
- Large Vacuum Fluorescent Display
- Serial Interface
- Analog Voltage Outputs
- Max Hold and Relative Reading
- Alarm with Relay



## Product Description

The Model 421 Hall Effect Gaussmeter is Lake Shore's answer to the dynamic changes in the permanent magnet industry. Faster update, higher resolution and more repeatable flux density measurements are being demanded by manufacturing, quality assurance and R&D. The Model 421 is well suited to meet these requirements at an affordable price. As an added advantage, the Model 421 includes one of Lake Shore's Hall probes (see following page for selection).

## Performance

High-performance instrumentation is no longer the exclusive domain of research laboratories. Performance requirements are tightening in every magnetic measurement application. In response, the Model 421 offers improved accuracy, resolution, noise floor, and update rate.

## Throughput

Throughput involves much more than update rate of an instrument. Useability of an instrument is just as important. The Model 421 has a large, bright, vacuum fluorescent display that can be seen easily in any lighting condition. The display updates quickly for fast feedback of probe or magnet positioning. The operation is straightforward with display prompts for the user. Max Hold, Alarm and Sort features are included to streamline sorting and testing operations.

## Automation

The Model 421 has a variety of interface features that are compatible with automated test configurations. The RS-232C serial computer interface can perform nearly every function of the instrument front panel. Two analog voltage outputs and an alarm relay facilitate automation without a computer.

## Probes

The Model 421 includes one of Lake Shore's Hall probes (see following page for selection). This group of probes covers a wide variety of application requirements. The Model 421 is also compatible with the extensive line of Lake Shore probes. Lake Shore probes are factory calibrated for accuracy and interchangeability. Calibration data is loaded into a PROM located in the probe connector so that it does not have to be entered by the user. Lake Shore can also custom design a probe to meet your specific application requirements.

## Normal Reading



The Model 421 has a 2 line by 20 character vacuum fluorescent display, with resolution to 4¾ digits. The display can accommodate seven measurement ranges from 300.00 mG to 300.00 kG. Measurements can be displayed in either gauss or tesla.

## Max Hold On



The largest field magnitude seen since the last max reset is displayed with the Max Hold function. The maximum value is shown in the lower display while the upper display contains the live reading.

## Alarm On



The alarm gives an audible and visual indication of when the field value is selectively outside or inside a user specified range. An output relay facilitates pass/fail actuation.

## Sort On



The sort function allows the Model 421 to display pass or fail when it is used during repetitive testing or sorting. The live reading is shown in the upper display while the lower display contains the pass/fail message.

# Model 421 Rear Panel

## 1 - Line Input Assembly

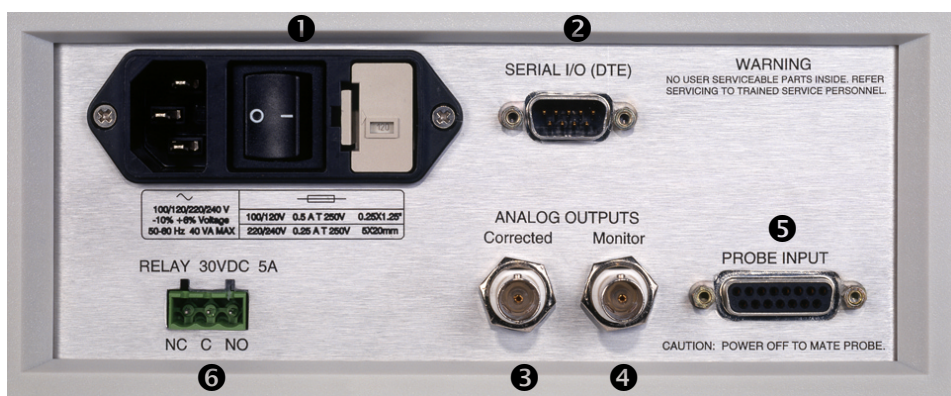
## 2 - Serial I/O Interface

## 3 - Corrected Analog Output

## 4 - Monitor Analog Output

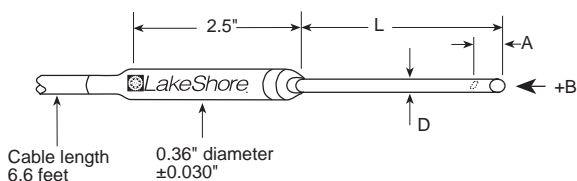
## 5 - Probe Input

## 6 - Relay Terminals



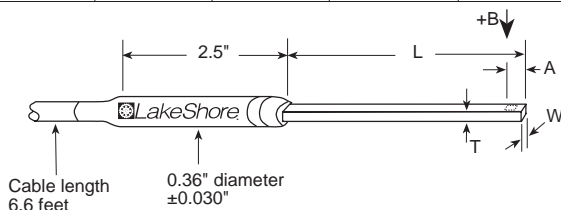
## Hall Probes\*

### Axial Probes



Model	L	D	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% of reading)	Operating temperature range	Temperature coefficient (maximum) Zero	Temperature coefficient (maximum) Calibration
MMA-2502-VH	2" ±0.063"	0.25" dia ±0.006"	0.010" ±0.005"	0.030" dia (approx)	Aluminum	DC and 10 Hz to 400 Hz	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	-0.04%/°C
MNA-1904-VH	4" ±0.125"	0.187" dia ±0.005"	0.005" ±0.003"		Fiberglass epoxy						
MMA-2502-VG	2" ±0.063"	0.25" dia ±0.006"	0.010" ±0.005"		Aluminum		300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	±0.005%/°C
MNA-1904-VG	4" ±0.125"	0.187" dia ±0.005"	0.005" ±0.003"		Fiberglass epoxy						

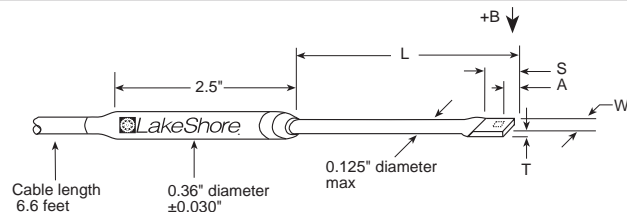
### Transverse Probes



Model	L	T	W	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% of reading)	Operating temperature range	Temperature coefficient (maximum) Zero	Temperature coefficient (maximum) Calibration
MMT-6J04-VH	4" ±0.125"	0.061" max	0.180" ±0.005"	0.150" ±0.050"	0.040" dia (approx)	Aluminum	DC	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	-0.04%/°C
MNT-4E04-VH	4" ±0.125"	0.045" max	0.150" ±0.005"			Rigid glass epoxy	DC and 10 Hz to 400 Hz					
MMT-6J04-VG	4" ±0.125"	0.061" max	0.180" ±0.005"			Aluminum	DC	300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	±0.005%/°C
MNT-4E04-VG	4" ±0.125"	0.045" max	0.150" ±0.005"			Rigid glass epoxy	DC and 10 Hz to 400 Hz					

### Flexible Transverse Probes

"L" = 3", "S" = 0.375"



Model	W	T	A	Active area	Stem material	Frequency range	Usable full scale ranges	Corrected accuracy (% of reading)	Operating temperature range	Temperature coefficient (maximum) Zero	Temperature coefficient (maximum) Calibration
MFT-3E03-VH	0.135" max	0.025" max	0.125" ±0.006"	0.040" dia (approx)	Flexible tubing	DC and 10 Hz to 400 Hz	30 G, 300 G, 3 kG, 30 kG	±0.25% to 30 kG	0 °C to +75 °C	±0.09 G/°C	-0.04%/°C
MFT-3E03-VG							300 G, 3 kG, 30 kG	±0.15% to 30 kG		±0.13 G/°C	-0.005%/°C

\* The Model 421 includes one of the Lake Shore probes listed above. Please specify probe model number when ordering.

# Model 421 Specifications

## General Measurement

Number of Inputs: 1

Update Rate: 5 readings per second on display; up to 18 readings per second with serial interface

Probe Compatibility: Standard and custom probes, including Model 420 probes

Probe Features: Linearity Correction, Auto Probe Zero

Measurement Features: Auto Range, Max Hold, Relative Mode, Filter

Probe Connector: 15 pin D style

## DC Measurement

DC Display Resolution: 4 $\frac{3}{4}$  digits with filter, 3 $\frac{3}{4}$  digits without filter

Range	Resolution w/ Filter	Resolution w/out Filter
HST Probe		
300 kG	0.01 kG	0.1 kG
30 kG	0.001 kG	0.01 kG
3 kG	0.0001 kG	0.001 kG
300 G	0.01 G	0.1 G
HSE Probe		
30 kG	0.001 kG	0.01 kG
3 kG	0.0001 kG	0.001 kG
300 G	0.01 G	0.1 G
30 G	0.001 G	0.01 G
UHS Probe		
30 G	0.001 G	0.01 G
3 G	0.0001 G	0.001 G
300 mG	0.01 mG	0.1 mG

DC Accuracy:  $\pm 0.20\%$  of reading  $\pm 0.05\%$  of range

DC Temperature Coefficient:  $\pm 0.05\%$  of reading  $\pm 0.03\%$  of range/ $^{\circ}\text{C}$

## AC RMS Measurement

AC Display Resolution: 3 $\frac{3}{4}$  digits

Range	Resolution
HST Probe	
300 kG	0.1 kG
30 kG	0.01 kG
3 kG	0.001 kG
300 G	0.1 G
HSE Probe	
30 kG	0.01 kG
3 kG	0.001 kG
300 G	0.1 G
30 G	0.01 G
UHS Probe	
30 G	0.01 G
3 G	0.001 G
300 mG	0.1 mG

AC Frequency Range: 10 Hz – 400 Hz

AC Accuracy:  $\pm 2\%$  of reading (50 Hz – 60 Hz)

AC Frequency Response: 0 to -3.5% of reading (10 Hz – 400 Hz)

(All AC specifications for sinusoidal input  $>1\%$  of range)

## Front Panel

Display Type: Large 2 line by 20 character, vacuum fluorescent display

Display Resolution: To  $\pm 4\frac{3}{4}$  digits

Display Update Rate: 5 readings per second

Displays Units: Gauss (G), Tesla (T)

Units Multipliers:  $\mu$ , m, k

Annunciators: 

RMS	AC input signal
DC	DC input signal
MAX	Max Hold value
▲	Relative reading
R	Remote operation
♪	Alarm on

Keypad: 12 key membrane

Front Panel Features: Intuitive operation, display prompts, front panel lockout, brightness control

## Interfaces

RS-232C Capabilities:

Baud: 300, 1200, 9600

Connector: DE-9, DTE configuration

Software Support: LabView Driver (consult Lake Shore for availability). Compatible with Model 420 command set.

Alarm

Settings: High and low set point, Inside/Outside, Audible, Sort

Actuators: Display annunciator, sort message, beeper, relay

Relay

Number: 1

Contacts: Normally open (NO), normally closed (NC) and common (C)

Contact Rating: 30 VDC at 2 A

Operation: Follows alarm

Connector: Detachable terminal block

Monitor Analog Output

Configuration: Real time analog voltage output

Range:  $\pm 3$  V

Scale:  $\pm 3$  V =  $\pm$ FS on selected range

Frequency Response: DC to 400 Hz

Accuracy: Probe dependent

Minimum Load Resistance: 1 k $\Omega$  (short circuit protected)

Connector: BNC

Corrected Analog Output

Configuration: Voltage output generated by DAC

Range:  $\pm 3$  V

Scale:  $\pm 3$  V =  $\pm$ FS on selected range

Resolution: 1.25 mV

Update Rate: 5 updates per second

Accuracy:  $\pm 0.35\%$

Minimum Load Resistance: 1 k $\Omega$  (short circuit protected)

Connector: BNC

## General

Ambient Temperature: 15 – 35  $^{\circ}\text{C}$  at rated accuracy. 5 – 40  $^{\circ}\text{C}$  with reduced accuracy

Power Requirement: 100, 120, 220, 240 VAC (+5%, -10%), 50 or 60 Hz, 20 watts

Size: 217 mm W x 90 mm H x 317 mm D, half rack (8.5" x 3.5" x 12.5")

Weight: 3 kg (6.6 lbs)

Approval: CE Mark

## Ordering Information

Part number	Description
Instrument	
421	Model 421 Gaussmeter plus one probe (Specify line voltage and probe model number)

## Accessories Included

106-741	Terminal block for relay outputs
115-006	Detachable line cord (U.S.)
4060	Zero gauss chamber
MAN-421	Model 421 Gaussmeter User's Manual

## Accessories Available

RM-1/2	Rack mount kit for one 1/2 rack gaussmeter in 482.60 mm (19") rack
RM-2	Rack mount kit for two 1/2 rack gaussmeters in 482.60 mm (19") rack
MCBL-6	User programmable cable with PROM (6' long)
MPEC-10	Probe extension cable with EEPROM (10' long)
MPEC-25	Probe extension cable with EEPROM (25' long)
MPEC-50	Probe extension cable with EEPROM (50' long)
MPEC-100	Probe extension cable with EEPROM (100' long)
(Extension cables must be matched to probes)	

One Probe Included (Additional probes ordered separately)

Custom Probes Available (Consult Lake Shore for more information)



Lake Shore Cryotronics, Inc.

575 McCorkle Blvd.

Westerville, Ohio 43082-8888

Tel: (614) 891-2244

Fax: (614) 818-1600

Email: sales@lakeshore.com

www.lakeshore.com

Specifications subject to change without notice.

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